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- 1. The water supply for agriculture and for the rural population in Imperial (Tsarist) Russia was very unsatisfactory. In the southern and southeastern areas it was so bad that there were frequent crop failures and epidemics of sickness among the population. Sometimes conflagrations destroyed entire villages because there was no water for fire fighting.
- 2. The USSR authorities actually gave some attention to the water supply for the agricultural population, but for a long time this attention was limited to good wishes and general projects in the Gosplan State Planning Commission.
- A series of publications and other material issued by the agricultural section of the Gosplan provides the possibility of understanding all the fundamentals which formed the basis for the plans for improvements, as well as their basic principles. The following main considerations were to be observed in all plans for agricultural improvements:
 - A. Systematic computation of the needs of agricultural improvements in the various zones and the possibilities natural, technical and economic for their achievement.

B, A scheme for consistent realization of the first systematic plan.

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- 4. In order to work out such a plan it was necessary to establish first the basic principles to guide the creators of the plan. Such principles were:
 - A. Greater productivity of agriculture in the USSR. This principle must determine the character of improvements and their need by individual zones.

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- B. The creation of an organization to assist agricultural economy on the territories of the USSR, based on considerations of a strategic character. This principle means consistency and intensiveness in the carrying out of improvements in individual zones.
- 5. The need for improvements and their feasibility were determined by three groups of leading factors:
 - A. Natural: climate, hydrological conditions and character of soil;
 - B. General economic: land, rural economy and economic conditions;
 - Strategic considerations.
- 6. In the territory of European USSR these factors were divided unequally, varying according to the separate zones. These differences, especially those pertaining to nature, follow definite laws. The changes in nature follow the direction from the northwest to the southeast of the USSR. The factors of agricultural economy and economics change in the direction from the southwest to the northeast. And, finally, strategic factors change from north to south.
- On the basis of the characteristics noted above, all the territory of the European USSR fell into definite meliorative zones. The improvements needed in each zone varied in kind and form, intensity of technics, and economics. The state plan for meliorations in the agricultural economy were to be drawn up according to zones. (See Enclosure A). The basic principles of plans for improvements on the one hand, and the natural and economic conditions of the margin areas on the other, were to determine the main types of improvements in various zones, and the outlines (See Enclosures C, D, and E) of various zones serve as a guide. The facts shown thereon give a picture of the distribution of waste lands in European USSR, and prove its conformity with the directions of the climatic factors.
- 8. The main reason for the existence of waste lands lies in the absence of regular natural increases and decreases in moisture in the soil, as needed by agriculture. The regulation of moisture in the soil must be taken as the basic factor in the irrigation improvements on the territroy of European USSR. The need of soils and vegetation for moisture is tied to the intensity of evaporation caused by climatic conditions in each zone and, consequently, by a proportionate shortage of humidity in the air and by the temperature of the air.
- 9. If the rate of evaporation in the upper soils and vegetation is represented by the symbol E, the increase of moisture by P, and the average coefficient of drainage for a zone by "e", the average coefficient of natural increases and decreases of moisture is indicated by the formula exp. On the basis of the above formula, Professor A. Kostyakov (Director of the Research Institute of Melioratization and author of many technical books) figured out the average coefficients and classified them in a table (See Enclosure B).
- 10. The entire territory of European USSR can be divided into the following zones on the basis of the formula:
 - A. The zone where the ratio $\frac{e \times P}{E}$ is always over 1.0 which indicates this zone has the necessary amount of moisture;
 - B. The zone where the ratio $\frac{e \times P}{E}$ is between 0.5 and 1,25, according to season and location, which is a zone of inconstant moisture.
 - C. The zone where the ratio $\frac{e \times P}{E}$ is always under 1.0, which indicates this zone is one of insufficient moisture, or arid.

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11. If the coefficients for each guberniya obtained from the formula are traced on a chart, the entire territory of European USSR can be divided into three large zones:

- A. The north northwest mone, having sufficient moisture, including the following provinces: Arkhangel'skaya, Vologodskya, Olentskaya, Leningradskaya, Novgorodskaya, Pskovskaya, Minskaya, Mogilevskaya, Smolenskaya, Tverskaya, Yaroslavskaya, Kostromskaya, and parts of Kaluzhskaya and Vladimirskaya.
- B. The central zone, having inconsistent moisture, includes the following provinces: Volynskaya, Podol'skaya, Kievskaya, Chernigovskaya, Poltavskaya, Orlovskaya, Kurskaya, Kharkovskaya, Tul'skaya, Ryazanskaya, Nizhegorodskaya, Tambovskaya, Penzenskaya, Kazanskaya, Vyatskaya, Permskaya, Ugimskaya, and part of Moskovskaya, Vladimirskaya and Orenburgskaya.
- C. The south southeastern zone, having insufficient moisture, includes the following provinces: Saratovskaya, Astrakhanskaya, Donskaya oblast, Ekaterinoslavakaya, Tavricheskaya, Khersonskaya, Bessarabskaya, Ural'skaya, and Samarskaya.

Enclosures: (A) Outline of meliorative zones.

(B) Average coefficient of natural increases and decreases of moisture.

(C) Approximate Area of unproductive lands by separate provinces

- in thousand desystimas (2.70 acres).

 (D) Approximate Areas of sands in thousand desystimas (2.70 acres).
- (D) Approximate Areas of sands in thousand desystinas (2.70 acres
 (E) Exact lengths of waterways in versts per 1,000 square versts of area by separate provinces.

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ENCLOSURE A

Outline of Meliorative Zones

Main forms of improvements The zones comprise of Meliorative zone 50X1 the provinces below: Extensive drainage of fields Arkhangel'skaya Northern

and forests. Regulation and Vologodskaya channelling of rivers. Olonetskaya

Partial drainage of forests and Leningradskaya Northwestern fields. Drainage of fields for Novgorodskaya

intensive crops. Pskovkskaya

Tverskaya

Mogilevskaya More extensive drainage of Western fields and forests by open Minskaya ditches. Drainage of meadows and Vitelskaya fields prepared for intensive crops.

Intensive drainage of fields and Kievskaya Southwestern meadows, using water-lifting Podol'skaya

machinery for irrigation of Poltavskaya fields and gardens. Chernigovskaya

Volynskaya

Irrigation of fields by canals. Central agricultural Kurskaya Irrigation of meadows by

Kharkovskaya flooding. Reinforcement of Orlovskaya banks of gullies. Tambovskaya

Voronezhskaya

Nizhegorodskaya Kostromskaya

Orenburgskaya

Ural'skaya Orenburgskaya

Drainage of forests. Intensive Central industrial Moskovskaya Tverskaya drainage of meadows. Rein-

forcement of banks of gullies. Vladimirskaya Ryazanskaya Tul'skaya Kaluzhskaya

Extensive drainage of meadows Northeastern Permskaya

> and forests. Flooding. Vyatskaya Ufimskaya Kazanskaya

Various types of drainage and Southeastern Ul. 'yanovskaya

reinforcement of banks of gullies. Simbirskaya Saratovskaya Samarskaya Astrakhanskaya

Southern Khersonskaya Various types of drainage and

reinforcement of banks of Ekaterinoslavskaya Tavricheskaya gullies.

Donskaya oblast

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Stavropol'skaya

ENCLOSURE B

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Average coefficient of natural increases and decreases of moisture.

Province	Coefficient	Province	Coefficient
Arkhangel'skaya	1.68	Tavricheskaya	0.65
Vologodskaya	1.51	Khersonskaya	0.50
Olonetskaya	1.60	Bessarabskaya	0.60
Leningradskaya	1.67	Ural'skaya	0.27
Novgorodskaya	2.00	Kurskaya	0.80
Pskovskaya	1.77	Kharkovskaya	0.82
Tverskaya	1.62	Voronezhskaya	0.85
Vitebskaya	1.81	Tul'skaya	1.05
Minskaya	1.55	Moskovskaya	1.35
Mogilevskaya	1.45	Vladimirskaya	1.40
Smolenskaya	1.55	Ryazanskaya	1.01
Volynskaya	1.23	Kostromskaya	1.55
Podol'skaya	0.98	Nizhegorodskaya	1.10
Kievskaya	0.88	Tambovskaya	0.93
Chernigovskaya	1.35	Penzenskaya	0.93
Poltav skaya	0.80	Kazanskaya	0.96
Orlovskaya	1.20	Vyatskaya	1.10
Saratovskaya	0.60	Permskaya	1.20
Astrakhanskaya	0.24	Ugimskaya	1.19
Donskaya oblast	0.51	Orenburgskaya	0.56
Ekaterinoslavskaya	0.68	Samarskaya	0.48

ENCLOSURE C

50X1

Approximate Area of Unproductive Lands by Separate Provinces in Thousand Desyatinas (2.70 Acres).

	Area				
Province	Absolute	Percentage	Province	Absolute	Percentage
Arkhangel'skaya	38,948	54•3	Kazanskaya	302	5 •3
Vologodskaya	1,911	5•3	Vyatskaya <u>√</u> Vyatk <u>a</u> 7	450	3.0
Olonetskaya	1,465	12.2	Permskaya	2,077	7.0
Leningradskaya	625	15.5	Ufimskaya	855	8.0
Pskovskaya	616	16.7	Orenburgskaya	1,895	11.3
Novgorodskaya	1,944	19•3	Samarskaya	1,515	11.0
Tverskaya	6 7 7	12.1	Astrakhanskaya	2,923	25.0
Yaroslavakaya	245	7.8	Kharkovskaya	330	6.8
Kostromskaya	596	7•9	Poltavskaya	162	3.8
Vladimirskaya	327	7•9	Chernigovskaya	343	7.8
Moskovskaya /Moscow/	166	5.6	Kievskaya	268	5•9
Kaluzhskaya /Kaluga/	7 117	4.2	Volynskaya	. 710	11.5
Tul'skaya /Tula/	80	2.9	Podol'skaya	180	4.9
Ryazanskaya	252	6.7	Bessarabskaya	162	4.1
Orlovskaya Orel	197	4.8	Khersonskaya	279	4.3
Kurskaya	145	3.5	Tavricheskaya	453	მ . ვ
Voronezhskaya	344	5•9	Ekaterinoslavakaya	351	6.1
Tamboskaya	291	4.9	Donskaya Oblast	1,433	10.0
Penzenskaya /Penze/	310 end	10.0	Vitebskaya	680	17.8
Saratovskaya	694	10.2	Smolenskaya	446	9•3
Simbirskaya	210	4.9	Mogilevskaya	656	15.6
Nizhegorodsk aya	336	7.4	Minskaya	1,690	21.9

Note: In reality the unproductive land areas were much larger because test surveys (1938) of certain provinces such as Moscow proved that the approximate figures of unproductive lands were greatly underestimated.

ENCLOSURE D

50X1

Approximate Areas of Sands in Thousand Desystimas (2.70 Acres).

Province	Area
Astrakhanskaya	4,000
Donskaya oblast	631
Terskaya oblast	525
Kharkovskaya	114
Poltavskaya	83
Tavricheskaya	81
Chernigovskaya	70
Voronezhskaya	65
Stavropol'skaya	50
Ekaterinoslavskaya	42
Saratovskaya	39
Samarskaya	39
Kievskaya	33
Vladimirskaya	19
Minskaya	19
Volynskaya	17
Tambovskaya	16
Mogilevskaya	15
Khersonskaya	_12
Kurskaya	12
Simburskaya	12
Vitebskaya	7
Orlovskaya	6
Smolenskaya	3
Ryazanskaya	3
Penzenskaya	2
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ENCLOSURE E

Exact Lengths of Waterways in Versts (1.067 KM) per 1,000 square versts of area by separate provinces

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Province	Length versts	Province	Length versts
Leningradskaya	136.4	Ul'yanovskaya	28.0
Novgorodskaya	115.2	Vladimirskaya	27.8
Pskovskaya	102.1	Ryazanskaya	25.6
Olonetskaya	100.3	Orlovskaya	25.1
Minskaya	91.7	Ki evskaya	23•5
Vitebskaya	91.3	Penzenskaya	21.3
Kaluzhskaya	82.0	Orenburgskaya	19.0
Tverskaya	82.0	Tambovskaya	18.3
Kostromskaya	80.0	Khersonskaya	15•9
Mogilevskaya	62.4	Voronezhskaya	15.0
Smolenskaya	59•9	Kurskaya	14.4
Yaroslavskaya	53.0	Saratovskaya	13.2
Vyatskaya	52•3	Donskaya oblast	12.6
Permskaya	42.2	Samarskaya	12.3
Moskovskaya	40.2	Podol'skaya	11.8
Ufimskaya	40.0	Ekaterinoslavskaya	10.6
Chernigovskaya	38.1	Astrakhanskaya	10.0
Nizhegorodskaya	37•4	Poltavskaya	8.7
Arkhangel'skaya	35•9	Kharkovskaya	5•3
Volynskaya	35•8	Tavricheskaya	3•7
Kazanskaya	35•5		